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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,667	08/19/2003	Yoshihiro Satoh	03186-1/2002-239455	3481

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EXAMINER

NOVACEK, CHRISTY L

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 05/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/642,667

Applicant(s)

SATO, YOSHIHIRO

Examiner

Christy L. Novacek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-10, 27 and 28 is/are allowed.
- 6) ☒ Claim(s) 11-26 and 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This office action is in response to the amendment filed February 23, 2005.

Response to Amendment

The amendment to the specification is sufficient to overcome the objections to the specification stated in the previous office action. Therefore, these objections are withdrawn.

The amendment of claims 1 and 6 is sufficient to overcome the objections to claims 1 and 6 stated in the previous office action. Therefore, these objections are withdrawn. The objections to claims 2-5 are also hereby withdrawn.

The limitations added to claims 1 and 6 are sufficient to overcome the admitted prior art and Saito (US 6,235,620) and Araki (JP 2000-031277) references. Therefore, the rejections of claims 1-10 under 35 U.S.C. 103(a) are hereby withdrawn.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 11-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito (US 6,235,620, previously cited) in view of Araki (JP 2000-031277, cited in IDS).

Regarding claim 11, Saito discloses depositing a metallic conductive film (8m) on an underlying insulating film (7), consecutively depositing first (12a) and second (12b) insulator films on the metallic conductive film, patterning the first and second insulator films, and patterning the metallic conductive film. Saito does not disclose selectively etching the second insulator film to configure the second insulator film to have a smaller patterned area than an area

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of the first insulator film. Like Saito, Araki discloses process of forming closely spaced metallic lines on a semiconductor substrate, forming a cap layer on the lines, and depositing insulator fill material in between the lines. Araki teaches that it is beneficial to etch the top (cap) layer on the metallic lines to narrow its width prior to depositing the insulator fill material because by providing a rounded top to the lines, the fill material can be deposited into the narrow areas between adjacent lines without the formation of voids. At the time of the invention, it would have been obvious to one of ordinary skill in the art to etch the second insulator layer of Saito such that it has a smaller width than that of the first insulator layer because Araki teaches that by providing a rounded top to the lines, the fill material can be deposited into the narrow areas between adjacent lines without the formation of voids.

Regarding claim 12, etching the second insulator film as taught by Araki results in the second insulator film having a width that is smaller than a width of the first insulator film.

Regarding claims 13 and 14, at the time of the invention, it would have been obvious to one of ordinary skill in the art to etch the second insulator layer either before or after the patterning of the metallic conductive film, as the order of these steps does not result in any functional difference in the product.

Regarding claim 15, Saito discloses patterning the metallic conductive film using the first and second insulator films as an etching mask.

Regarding claim 16, Saito discloses depositing a third insulator film (13) on the first and second insulator films and the underlying insulating film.

Regarding claims 17 and 18, Saito discloses etching back the third insulator film to configure a side-wall film covering the patterned metallic conductive film.

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Regarding claim 19, Saito discloses depositing a fourth insulator film (16/17/18) to embed therein the side-wall film on the underlying oxide film.

Regarding claims 20-22, Saito discloses conducting the steps of etching the fourth insulator film to form therein a contact hole by using the side-wall film as an etch stopper and forming a contact plug (21) in the contact hole after the step of depositing the fourth insulator layer.

Regarding claim 23, by modifying the lines of Saito as taught by Araki, the side-wall film will have a tapered mesa structure having a larger width toward a bottom thereof.

Regarding claim 26, Saito discloses fabricating a semiconductor memory device.

Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito in view of Araki as applied above, and further in view of the admitted prior art.

Regarding claims 24 and 25, Saito discloses that the first insulator layer is silicon oxide and the second insulator layer is silicon nitride. These layers are formulated so as to have etch selectivity between them. The admitted prior art discloses that it is conventional in the art to form capping layers of metal lines such that the first insulator layer is silicon nitride and the second insulator layer is silicon oxide. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use any conventional materials to comprise the first and second insulator films so long as they provide etch selectivity to one another because it is well-known in the art that these materials are functional equivalents.

Claims 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito in view of Araki as applied above, and further in view of Hsueh et al. (US 5,981,356).

Regarding claim 29, Saito and Araki fail to disclose wet etching the second insulator film. Like Araki, Hsueh discloses a process of rounding the corners of an oxide layer. Hsueh teaches that the rounding may be successfully accomplished by using either dry or wet etching (col. 2, ln. 39-56). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use wet etching to etch the second insulator layer of Saito because Hsueh teaches that either dry or wet etching can successfully round the oxide.

Response to Arguments

Applicant's argument that Araki and Saito fail to disclose configuring the second insulator layer such that it has a bottom width smaller than a width of the first insulator film has been fully considered and is found to be persuasive. Therefore, the rejections of claims 1-10 under 35 U.S.C. 103(a) have been withdrawn.

Allowable Subject Matter

Claims 1-10, 27 and 28 are allowed.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
May 12, 2005


AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800